USAID DCHA[1] ENVIRONMENTAL THRESHOLD DECISION
USAID/DCHA/ASHA Grant Activities

Award Number: AID-ASHA-G-11-00017
Sponsoring U.S. Organization: Medical Benevolence Foundation
Overseas Institution: Tumutumu Hospital
Host Country/Region: Kenya (Karatina, Nyeri County)
Life of Grant: 9/30/2011 to 12/31/2015
Amount of federal grant: $400,000 / Non-federal cost sharing: $104,750

ENVIRONMENTAL ACTION RECOMMENDED:	(Place X where applicable)
Categorical Exclusion: X	**Negative Determination w/ Conditions: X**
Positive Determination:	**Deferral:**
Bureau Environmental Threshold Decision (ETD):	Conditional approval of IEE

USAID DCHA Bureau Environmental Officer (BEO) Comments:

This Environmental Threshold Decision (ETD), from the DCHA Bureau Environmental Officer (BEO), is to inform the grantee that the subject line Initial Environmental Examination (IEE), has received a *conditional* 22 CFR 216 approval from the DCHA BEO on September 7, 2012.

USAID appreciated the response of Medical Benevolence Foundation and Tumutumu Hospital to the BEO concerns. The categorical exclusion is appropriate for the grantees proposed procurement of the nursing school's classroom, computer and electronic supplies. The Negative Determination with Conditions is appropriate for the grant's construction of an academic building at the Tumutumu Hospital campus. However, an additional issue remains in water quality assurance of hospital drinking water for patients and staff.

DCHA BEO Conditions:

For the ASHA program AID-ASHA-G-11-00017: the grantee must ensure the following conditions related to the hospital's water supply and drinking water quality are addressed:

[1] The Bureau for Democracy, Conflict and Humanitarian Assistance (DCHA) which houses the ASHA office within USAID.

BEO Request: What is the hospital's water source (borehole?) and availability of water (e.g. groundwater pumping or abstraction rate). - **Summary of grantee response: The hospital's water sources include surface water abstraction from the Ragati River, approximately 18km from the hospital, an onsite borehole back-up supply used during low water pressure from the river and rainwater harvesting in tanks. The water is expected to be used during construction and operation phases.**

Potable water quality- is a particular concern not fully addressed in the IEE. While the hospital's integrated approach to water supply has great benefits in terms of sustainability, surface and rain waters in particular may be at higher risk of contamination from upstream sources of pollution or from contaminants accumulated on the surfaces of water diversion and capture structures. As the IEE notes on page 4, the pollution of the Ragati River is of potential concern.

Condition- T**he grantee must ensure the quality of its drinking water through periodic water quality testing and treatment of drinking water sources, as determined necessary by the testing results.**

These conditions are in accordance with the "Programmatic Initial Environmental Examination (P-IEE) of Small-scale Construction and Commodity Procurement Activities for the USAID American Schools and Hospitals Abroad (ASHA) Program (ETD, 2011)." This ASHA P-IEE document can be accessed via the USAID IEE Database at: http://gemini.info.usaid.gov/egat/envcomp/document.php?doc_id=38656.

Please note that all USAID approved IEEs are entered into the USAID IEE Database,

http://www.usaid.gov/our_work/environment/compliance/database.html

This Environmental Threshold Decision (ETD) is an official communication from the DCHA Bureau Environmental Officer (BEO) outlining the actions required of the ASHA grantee to ensure the subject program's compliance with the environmental regulatory requirements under 22 CFR 216.

ENVIRONMENTAL COMPLIANCE FACE SHEET (ECF) FOR INITIAL ENVIRONMENTAL EXAMINATION AND/OR REQUEST FOR CATEGORICAL EXCLUSION FOR DCHA/ASHA PROGRAMS

Sponsoring U.S. Organization Name:	**Medical Benevolence Foundation**
City, State:	**Houston, TX**
Key Contact:	**John Haynes**
Email Address:	**jhaynes@mbfoundation.org**
Overseas Institution Name:	**Tumutumu Hospital**
Country:	**Kenya**
Award No. AID-ASHA-G-11-00017	**Life of grant *(m/d/yyyy)*: from 9/30/2011 to 12/31/2015**
Amount of federal grant: $400,000.00	**Non-federal cost sharing: $104,750.00**

SUMMARY OF FINDINGS:

All USAID projects must conform to USAID's environmental procedures (22 C FR 216) requiring evaluation and action to ensure that adverse environmental impacts are assessed and mitigated. The Request for Categorical Exclusion (RCE) or Initial Environmental Examination (IEE) for the USAID DCHA American Schools and Hospitals Abroad (ASHA) program provides the first review of the reasonably foreseeable effects on the bio-physical Environment and human welfare for the activities under the ASHA Program. The ECF, that accompanies the RCE or IEE, summarizes the recommended 22 CFR 216 determinations and provides for mandatory USAID clearances.

RECOMMENDED DETERMINATIONS:

☒ A **Categorical Exclusion** pursuant to 216.2c(2)(i), *Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (e.g. construction of facilities)*, is recommended for the following ASHA activities: development of training materials, awareness raising campaign and limited commodity support, including computers, IT networking, cameras, desks, chairs, etc.

☒ A **Negative Determination with Conditions** pursuant to 22 CFR 216.3(a)(2)(iii), is recommended for the following ASHA activities: small-scale construction and rehabilitation of schools, universities and hospitals.

CONDITIONS:

USAID ASHA will ensure that the ASHA grantee will follow the environmental compliance conditions for the following ASHA activities classified as a **Negative Determination with Conditions:**

☒ Construction and/or rehabilitation of schools and hospitals, the AOR will ensure that ASHA implementing partners will adhere to the "*Programmatic Initial Environmental Examination (P-IEE) of Small-Scale Construction and Commodity Procurement for ASHA Program"* which was cleared by the DCHA Bureau Environmental Officer on July 7, 2011. This ASHA Programmatic Initial Environmental Examination (P-IEE) is a global scale assessment of foreseeable environmental impacts as a result of ASHA programs. The P-IEE serves as a pre-award decisional document for purposes of the disbursement of funds to the awardee. The P-IEE provides for an analysis of foreseeable environmental impacts and mitigation measures, as assessed at a global scale. Country and project-specific environmental setting and baseline conditions will be identified by the ASHA awardee in a supplemental Country-level IEE, tiering off of the global analysis in the P-IEE.

LIMITATIONS:

This IEE does not provide an Environmental Threshold Decision for the following activities, which would require additional supplemental analysis:

1. Large-scale activities (e.g., >10,000 ft^2 building construction, etc.)
2. Operation in environmentally-sensitive areas such as protected areas, wetlands and/or wildlife reserves.
3. Activities that include pesticide procurement and/or use, transport, storage or disposal which would require additional analyses pursuant to 22 CFR 216.3(b), USAID's Pesticide Procedures.

USAID APPROVAL OF ENVIRONMENTAL ACTION(S) RECOMMENDED:

CLEARANCE:

Tamra Halmrast-Sanchez, Director
DCHA/ASHA

Date: 6/5/2012

Mary T. Herbert, AOR
DCHA/ASHA

Date: 5/23/12

CONCURRENCE: Erika J. Clesceri, BEO DCHA

Digitally signed by Erika J. Clesceri, BEO DCHA
DN: cn=Erika J. Clesceri, BEO DCHA, o=USAID, ou=USAID DCHA, email=eclesceri@usaid.gov, c=US
Date: 2012.09.07 11:12:05 -04'00'

Date:

Erika J. Clesceri, Ph.D.
Bureau Environmental Officer

Approved: X

Disapproved: _____

REQUEST FOR CATEGORICAL EXCLUSION[1]

NOTE: For use ONLY when **Categorical Exclusions** are requested for ALL proposed activities of a project (i.e., ASHA projects with non-hazardous commodity procurement only, as described below.)

1. Background and Program Description

The ASHA Program in the USAID Bureau for Democracy, Conflict and Humanitarian Assistance (DCHA) provide grants to competitively-selected private, non-profit universities and secondary schools, libraries, and medical centers abroad. ASHA programs seek to strengthen self-sustaining schools, hospitals, medical clinics and libraries that best demonstrate American ideals and practices. In addition, these grants foster cultural interchange, mutual understanding and favorable relationships with the USG as well as to serve as the center for the promotion of civil societies in the host nations. The program anticipates grants in Africa, Latin America, Asia, Eurasia and Middle East. Many of these grants typically fund activities to procure commodities computers, IT networking, cameras, desks, chairs, etc.

NOTE: The ASHA program also supports to procurement of medical equipment and small-scale construction and rehabilitation. The 22 CFR 216 compliance is addressed in separate Initial Environmental Examinations addressing impact and mitigation measures for these activities.

2. Justification for Categorical Exclusion Request

A **Categorical Exclusion** is recommended for activities involving development of training materials, awareness raising campaign and limited commodity support, including computers, IT networking, cameras, desks, chairs, etc. No environmental impacts are expected as a result of this type of commodity procurement and according to the criteria of Title 22 of the Code of Federal Regulations, Regulation 216 (22 CFR 216), subparagraph 2(c)(1) and the *classes of action* pursuant to 22 CFR 216.2 (c)(2):

(i) Education, training, technical assistance training programs and/or except to the extent such programs include activities directly affecting the environment (such as construction of facilities, etc.), 22 CFR216.2 (c)(2)(i);

NOTE: This classification does NOT include the purchase of commodities and/or the acquisition of equipment, which could generate a medical / toxic / radiological or hazardous waste.

The tabulation of commodities or "Master Set", **attached**, provides a list of commodities that are planned for purchase by the subject ASHA project(s) that are recommended for a **Categorical Exclusion**:

[1] Project-specific information provided in associated ASHA Environmental Compliance Facesheet (ECF).

complete this section before recording acquisitions in the ROC table to the right

APPROVED MASTER SET (MS) A

A ID	Purchase Order	estimated costs in $50 increments
A01	CLASSROOM FURNISHINGS	10,000
A02	LABORATORY FURNISHINGS	10,000
A03	COMPUTERS	10,000
A04		
A05		
A06		
A07		
A08		
A09		
A10		
A11		
A12		
A13		
A14		
A15		
A16		
A17		
A18		
A19		
A20		
	Estimated subtotal this page $	30,000
	Cumulative total $	30,000

print name (and sign here)

John S. Haynes

John S. Haynes

A — Mary D. Hakel 5/16/12 DSA/IOR/SHA Date: 5/4/2012

REPORT ON CC

PURCH

date	EACH	actual costs
		0.00
		0.00
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Subtotal this page $		0.00
Cumulative total $		0.00

Date:

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

OF FACILITIES CONSTRUCTED OR RENOVATED

UNDER

USAID/ASHA GRANTS

Construction of a Two Storey Academic Block At PCEA Tumutumu Hospital, Kenya

INITIAL ENVIRONMENTAL EXAMINATION REPORT
FEBRUARY 2012

Prepared by Mazingira & Engineering Consultants Ltd

TABLE OF CONTENTS

Acronyms and Abbreviations

IEE	Initial Environmental Examination
NEMA	National Environmental Management Authority
EIA	Environmental Impact Assessment
EA	Environmental Audit
EMCA	Environmental Management and Co-ordination Act, 1999
GOK	Government of Kenya
KRCHN	Kenya registered community health nurse

1.0 BACKGROUND

P.C.E.A Tumutumu Hospital is a Church Health Institution located in Karatina, Nyeri County, Kenya under the Management of the Presbyterian Church of East Africa. The Hospital was established by Church of Scotland Missionaries and Kikuyu evangelists on the southern slopes of Tumutumu Hill in 1908. Like all Church of Scotland activities in Kenya, Tumutumu Hospital was handed over to the Presbyterian Church of East Africa in 1956.

P.C.E.A. Tumutumu School of Nursing is situated within the premises of P.C.E.A. Tumutumu Hospital. It is located about 3 km from Karatina and approximately 1 km off Karatina Nyeri road.

The School of Nursing was formally started in 1949 and since then different cadres of nurses have been trained.

- → 1989 – ECHN programme started
- → March 2006 KRCHN (Diploma course) commenced
- → March 2007 Both KRCHN In-service and E Learning Diploma upgrading course started

The proposed academic building at the PCEA Tumutumu Nursing School is one of many projects intended for funding under USAID/ASHA Grant.

The IEE was prepared by Mazingira & Engineering Consultants Ltd whose professional team included:

- → William Kagia Gathua. Lead Expert in EIA/EA
- → Simon Mathenge Wanyitu. Lead Expert in EIA/EA

The report describes the project including project inputs, activities and possible environmental impacts likely to arise from the implementation and operation of the project. In addition, the report proposes appropriate mitigation measures where negative impacts are likely to occur and ways to enhance the positive impacts, if any.

The water and electricity demand will become high and simultaneously the production of solid waste, waste water and sewerage will be increased during the operation. These can cause negative impacts on the project, hence these important facts should be properly evaluated and appropriate precautions and solutions must be adopted as discussed in the report. Even though the storm water is not an impact, it is advisable to introduce reliable storm water disposal system minimize the problems during the rainy season.

There are also inherent positive impacts in the project that include: improved academic facilities, source of employment to the locals, optimal land use, market for supply of building materials during construction and gains in the local and national economy

In summary, the potential negative impacts of the project are low and can be mitigated through the recommended mitigation measures; therefore they should not prevent the project from proceeding. The positive impacts and the benefits to the community are immense and welcome.

Pursuant to the IEE findings and in compliance with local environmental requirements, the project requires an Environmental Impact Assessment (EIA) to identify and mitigate potential adverse impacts on the environment of the construction of the academic building.

1.1 Description of Activities

The scope of work is to construct a new two-storey academic building. The technology used in the design and development of the project will be based on international standards, which have been customized by similar development in the country.

1.2 Purpose and Scope of this IEE

The purpose of this IEE is to review the reasonably foreseeable effects on the environment of a proposed action and identify the mitigation and monitoring actions needed. An IEE is a streamlined version of an environmental impact assessment (EIA). The purpose of the IEE is to provide USAID/ASHA and host country decision-makers with a full discussion of significant environmental effects of a proposed action. It includes alternatives which would avoid or minimize adverse effects or enhance the quality of the environment so that the expected benefits of development objectives can be weighed against any adverse impacts upon the human environment or any irreversible or irretrievable commitment of resources.

2.0 ENVIRONMENTAL BASELINE INFORMATION

The project site is located in Tumutumu, Mathira, Nyeri County, Kenya and neighbours several residential premises with associated developments including good road network, electricity supply and other infrastructure.

Mathira lies at an altitude of 1700m above sea level, but this height ranges from 1600m (to the east) to 2000m (to the West). It is located between longitude 37° 05' & 37° 10' east and between latitude 0° 25' & 0° 30' South about 40 km South of the Equator and situated at an elevation of about 5,500 feet above sea level, placing its high affect for the cooler air to keep its temperatures moderate.

Climate

The average daily temperature throughout the year varies slightly from month to month with average temperatures of around 16.8 degrees Celsius during the months of July and August to about 20 degrees Celsius in March. But, the daily range is much higher, with the differences between maximum and minimum temperatures each day around 10 degrees in May and up to 15 degrees in February. Between the months of June to September, southeast winds prevail in the coastal parts of Kenya and last up to several days without a break. The clouds cause day temperatures to remain low and most times the maximum temperature stay below 18 degrees Celsius. The minimum temperatures also remain low during cloudy nights, usually hovering around 8 degrees Celsius and sometimes even reaching 6 degrees Celsius. Clear skies in January and February also bring colder nights.

Because of the area's location just south of the equator in combination with humid air pumped in from the Indian Ocean, the humidity values for each day are generally on the higher end.

This is not to say that values are always high, since the easterly winds coming off the Indian Ocean tend to keep the temperatures standard throughout the country; therefore the "warm sticky" feeling is usually not associated with the area as much as one would think. In the summer to autumn months of January to April, relative humidity values have been known to plummet to anywhere from 10% to 20%. The typical day, humidity-wise, starts off with nearly saturated in the morning hours, and steadily decreases throughout the remainder of the day.

The average rainfall ranges between 1200 mm - 2,400mm. The area experiences Equatorial rainfall due to its location and being within the highland equatorial zone of Kenya. The rainfall is influenced by the rain shadow caused by Mt. Kenya and the Aberdare Ranges.

With routinely high relative humidity figures, it is not surprising that the area climate is one that produces much rain annually. In fact, from the past 50 years, the expected amount of rain could be anywhere in the range of 500 to 1500 mm, with the average ringing in at 900 mm. The majority of these rainfall figures crash down in the area in one major and one minor monsoon seasons respectively. The major monsoon season occurs within the months of March to May, and is called the "Long Rains" by the locals. The minor monsoon seasons emerges within the October to December Months, and is called the "Short Rains" although this pattern is occasionally disrupted by abrupt and adverse climatic conditions. That is what the meteorologists as a whole know about the monsoon seasons. What they do not know is exactly when these seasons will start. There is usually not an indication of when these rainy seasons will start, since it is difficult to determine when one starts and when the other finishes.

Winds along the surface are predominantly easterly throughout the entire year. They are shifted to northeast between October and April, and they are shifted southeast between May and September. Right before the "Long Rains" season, the strongest winds occur, reaching speeds of 20 to 25 miles per hour. During the rest of the year, winds are usually at speeds of 10 to 15 miles per hour. During the night, the winds are calm.

Geology and hydrogeogy

(a) Geology and soils

The wider area, including the site, is covered by tertiary volcanic rocks, mainly of alkaline type, and can be broadly grouped as follows:

- Laikipia Basalt and Sattima Series (fissile, pale-weathering lavas identified as phonolytes, olivine alkali-trachytes, mugearytes and fissile basalts), which cover the site area and the winder area;
- The trachytes and trachytic tuffs, which outcrop to the southwest;
- The Simbara Series, mainly basalts that outcrop in several patches and in the west;
- The Kenyte group, mainly porphyritic phonolytes, synytes and agglomerates;
- The Thomson Falls phonolytes.

Soil around the site area can broadly be classified as Andosols and Histosols. Whereas the Andosols are well drained, moderately deep to very deep, dark reddish brown clay loam to clay soils with a humic topsoil, the Histosols are imperfectly drained and relatively shallow, very friable, acid humic to peatly, loam to clay with rock outcrops and ice in the highest parts. Red soils are commonly 3-7m thick resulting from rock decomposition, while black soils cover most of the flatter ground. Distribution of red and black soils depends on drainage and oxygenation rather than nature of bedrock

(b) Hydro-geology

Mathira lies in the Tana River Drainage Basin. The major rivers that cross the area include Sagana and Ragati rivers. All these drain from the West and flow towards the Eastern direction as dictated by the topographical features. As the rivers pass through the town, industrial effluents, municipal waste and siltation heavily pollute them.

Ground water occurs in different and varied rock conditions depending on the geological set up, physiolographic nature of the study area, the permeability and porosity of the rocks formations and the weathering and fracturing of the rocks.

Recharge in the area is mainly by vertical and lateral infiltration and subsequent percolation of part of the annual rainfall of about 1500mm. Major lateral recharge of aquifers is strongly related to precipitation on the winder area. Several boreholes have been drilled in the vanity of the project area with the closest being at 0.5Km NNW, borehole No 10961. The project area has a relative high groundwater potential. The borehole yields inn the project area range from a low of 3.8m^3/hr to a high of 24m^3/hr.

Given that the area receives high amounts of rainfall annually, its hydrogeological potential is also high. In this area, groundwater is encountered within alluvium (also in upper weathered sections- "saprolyte"). Aquiferous sections are also encountered variably within fractures, joints, fissures and fault systems common in this area), at interfaces between different lava flows and within coarse pyroclastic series (volcanic deposits) and old land surfaces. The area has a high potential for shallow groundwater evidence in the numerous springs, which feed the rivers that start in the region.

Social - Economic

The area is well served, with good communication and transport network such as air, road, and railway. This network facilitates transportation of agricultural products from the area to Nairobi and other parts of the country.

Due to such rapid urban growth, provision of basic infrastructure for all has become an important concern in the area. Basic infrastructural services that have deteriorated due to such rapid increase in population include: Solid Waste Management (SWM) system; drainage; roads; mass transportation; electric installations. Greater environmental pollution and other problems have been the result of under-provision of such basic services.

Mathira area currently houses over 100,000 people with major economic activities are faming and livestock keeping, commercial activities, manufacturing and quarrying. Like most districts, Mathira has crowded markets and trading areas, middle class suburbs, and spacious mansions. It also has vast overcrowded tenements and slums and high unemployment.

3.0 ENVIRONMENTAL POLICIES AND PROCEDURES

Kenya has approximately 77 statutes, which relate to environmental concerns. Most of these statutes are sector specific, covering issues such as public health; soil erosion; protected areas; endangered species; water rights and water quality; air quality, noise and vibration; cultural, historical, scientific and archeological sites; land use; resettlement etc.

Previously, environmental management activities were implemented through a variety of instruments such as policy statements and sectoral laws and also through permits and licences. For example, the Physical Planning Act of 1996 empowers local authorities to request existing facilities to conduct environmental assessments, while under Local Government Act of 1998; it is an offence to emit smoke, fumes or dust which may be a source of danger, discomfort or annoyance.

With the enactment of the Environmental Management and Co-ordination Bill in December 1999, the institutional framework for environmental management has been strengthened. The Environmental Management and Co-ordination Act of 1999 (the Act) provides for the establishment of a National Environment Management Authority (NEMA), which became operational in July 2002 with the statutory mandate to co-ordinate all environmental activities.

The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out environmental impact assessment (EIAs) and environmental audits (EAs)

According to the Kenya National Environmental Action Plan (NEAP, 1994) the government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programs that disregard environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process Environmental Impact Assessments were introduced targeting the industrialists, business community and local authorities

Part II of the Environmental Management and Co-ordination Act, (EMCA) 1999, states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. It is worth noting that the entitlement to a clean and healthy environment carries a correlative duty. Hence, there is not only the entitlement to a clean and healthy environment, but also the duty to ensure that the environment is not degraded in order to facilitate one's own as well as other persons' enjoyment of the environment.

According to section 58 of the act, an environmental impact assessment study needs to be carried out on all projects specified in the second schedule of the act that are likely to have a significant impact on the environment.

Other Act governing implementation of projects includes:

- → The Water Act 2002
- → Public Health Act
- → Physical Planning Act, 1999
- → Building Code 2000
- → Occupational Safety and Health Act, 2007

Regulatory Framework

- → Environmental Impact Assessment and Environmental Audit regulations, 2003
- → Waste Management Regulations 2006
- → Water Quality Regulations 2006
- → Conservation of Biological Diversity (BD) Regulations 2006
- → Fossil Fuel Emission Control Regulations 2006
- → Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

4.0 POTENTIAL ENVIRONMENTAL IMPACTS

4.1. Potential adverse impacts during construction

(i) Biodiversity

The main construction activities having negative results on the biodiversity are excavations and effluent discharges. However, the potential negative impacts are not considered very significant, and will not affect any sensitive or critical area.

(ii) Extraction and use of building materials

Building materials such as hard core, ballast, cement, rough stone and sand required for construction of the project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(iii) Soil erosion and pollution

The total volume of soil that would be excavated during plant construction is relatively small and thus should not lead to major erosion problems and impacts on soils.

Soil pollution from on-site as well as off-site works may occur by the intentional or accidental leakage of used chemicals, fuel, or oil products (from equipment and vehicles) on construction sites. Such practices should be strictly avoided and utmost precautions and workmanship performance should be adopted for the disposal of such hazardous products. *The impact is negative, direct, short term, reversible and unlikely to be significant.*

(iv) Dust emissions

An increase in ambient particulate matter may be observed primarily during the excavation activities and to a small extent, transport vehicles delivering building materials. However, given the fact that excavation will last for a limited period of time, the impacts from potential dust generation will probably not be significant. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(v) Exhaust emissions

The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of CO_2, NO_x and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts. Because large quantities of building materials are required, some of which are sourced outside the area, such emissions can be enormous and may affect a wider geographical area. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent gunning of vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(vi) Noise and vibration

The construction works, delivery of building materials by heavy tucks and use of machinery/equipments including bulldozers, generators, metal grinders and concrete mixers will contribute to high levels of noise and vibration

within the construction site and the surrounding area. The noise impacts from excavation and associated truck movements are however limited to construction phase. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(vii) Risks of accidents and injuries to workers

In any civil works, public as well as construction staff safety risks can arise from various constructions activities such as excavations, operation and movement of heavy equipment and vehicles, storage of hazardous materials, disturbance of traffic, and exposure of workers to running sewers. Because of the short duration and non-complexity of the construction phase, such activities are controlled and consequently the associated risks are minimal. Proper supervision, high workmanship performance, and provision of adequate safety measures will suppress the likelihood of such impacts on public and occupational safety. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(viii) Solid waste generation

Large quantities of solid waste will be generated at the site during construction works. Such waste will consist of metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as paints, cement, adhesives and cleaning solvents, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. *This impact is considered negative, direct, short term, reversible and unlikely to be significant.*

(ix) Energy consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability.

The project will also use electricity supplied by KPLC. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

(x) Water resource

The construction activities will require large quantities of water which will be supplied from onsite borehole and hospital water supply. Water will mainly be used for concrete mixing, curing sanitary and washing purposes. Excessive water use may negatively impact on the water source and its sustainability.

No major on-site impacts on water resources are anticipated during the construction phase. Care should however be exercised when handling fuel and oil (hydraulic, transmission, engine, etc.). Measures should be taken to avoid spillage of such material to the ground, as these contaminants would eventually reach the groundwater. Dumping excavated and construction material into nearby watercourses should be prohibited. Additionally, all earth-moving and other equipments should be in good working condition and well maintained (no leaks). Off-site impacts on water resources may occur from the reckless disposal of domestic waste. Where proper waste segregation and disposal is practiced, the likelihood of these impacts to occur will be negligible, if not nil.

4.2. Potential adverse impacts during operation

(i) Solid waste generation

It is expected that the solid waste generated from the operational phase of the proposed project will be mostly of non – toxic domestic nature with a high proportion of biodegradable matter. Non organic wastes will mostly consist of textiles, glass, metal cans, plastic bottles and bags.

Strict guidelines will be put in place in order to manage the solid waste production during the operational phase of the development. The main goals of the guidelines will be to ensure adopting recycling techniques and encouraging sorting of solid waste at source into organic and inorganic wastes. Due to the high volume of solid waste generated, recycling and composting techniques will be encouraged to reduce amount of solid waste which will be carted away. As such the following mitigating measures are proposed:

- → Sorting at source will be encouraged to separate organic and inorganic solid wastes.
- → Materials such as plastic and glass may be sent to factories for recycling purposes

(ii) Storm water flow

The buildings roofs and pavements will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the premise. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging. *This impact is considered negative, direct, short term, irreversible and unlikely to be significant.*

(iii) Sanitation

Approximately, 80% of water will become wastewater after usage by the human beings. Improper management of waste water generated may cause pollution problems and spreading of diseases. Main sources of generation of wastewater are: staff and students toilets, and wash water from sinks and washbasins.

(iv) Energy consumption

During operation a lot of electrical energy will be used mainly for domestic purposes including lighting. Since electricity generation involves utilization of natural resources, excessive electricity consumption will strain the resources and negatively impact on their sustainability.

(v) Water use

The consumption of water will considerably increase with the construction of the project, which will be sourced from the borehole and hospital water supply. Hence, the amount of water that should be extracted from the ground and river will be significantly increased. Over extraction or pumping water beyond the safe limit can cause environmental issues. Especially, during the dry season, other water user around the hospital can encounter problems from getting ground water. Further, ground water can be contaminated due to extraction beyond the safe limits.

5.0 RECOMMENDED MITIGATION ACTIONS

In this chapter, recommendations are provided to mitigate the negative impacts. Enhancement measures that are considered essential to the overall project are also discussed.

5.1 Mitigation of adverse impacts during construction

(i) Minimization of construction waste

- Use durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements of nature i.e. sunshine, rain etc
- Containers or package for storing hazardous waste including used oil to be securely bunded and labelled as provided for by Waste Management Regulations, 2006
- Segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal
- Contract a licensed waste firm to collect solid waste from the site for dumping at an approved site
- Accumulate scrap metals in a scrapping yard and contract a scrap metal dealer with a valid license for appropriate disposal/recycling
- Minimizing waste generated by adopting cleaner production methods such as conserving raw materials, enabling the recovery and re-use of the waste product where possible.
- Use building materials that have minimal packaging to avoid the generation of excessive packaging waste
- Use construction materials containing recycled content where possible and in accordance with accepted standards.

(ii) Efficient sourcing and use of raw materials

- Source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose have undergone satisfactory environmental impact assessment/audit and received necessary approvals. These firms are expected to apply acceptable environmental performance standards so that the negative impacts of their activities at the extraction sites are considerably well mitigated.
- Have an accurate budget and estimation of actual construction requirements in order to ensure that materials are not extracted or purchased in excessive quantities.
- Ensure that wastage, damage or loss (through run-off, wind, etc) of materials at the construction site is kept minimal.

(iii) Minimization of vegetation disturbance

- Ensure proper demarcation of the project area to be affected by the construction works in order to restrict any disturbance of flora and fauna only on the actual project area and to avoid spill over effects on the neighbouring areas.
- Re-vegetate some of the disturbed areas through implementation of a well-designed landscaping programme.

(iv) Minimization of run-off and soil erosion

- Minimize soil erosion and associated sediment release from the project site during construction works.

(v) Reduction of dust generation and emission

- Minimize dust during construction through strict enforcement of on site speed controls as well as limiting unnecessary traffic within the project site.
- Ensure that excavation works are carried out in wet weather.
- Ensure that traffic routes on site are sprinkled with water regularly to reduce amount of dust generated by the construction trucks.
- Well controlled and careful transportation and stock- pilling of material can reduce the dust emission
- Material should not be dumped closer to the existing buildings
- Constructed site can be covered around the perimeter using Gunny sacks and can be watered frequently.

(vi) Minimization of exhaust emissions

- Have proper planning of transportation of materials to ensure that vehicle have maximum fills in order to reduce the number of trips done or the number of vehicles on the road.
- Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines at these points

(vii) Minimization of noise and vibration

- Minimize noise and vibration in the project site and surrounding areas through sensitization of drivers to switch off vehicle engines while offloading materials.
- Instruct the drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals.
- Ensure construction machineries are kept in good condition in order to reduce noise generation.
- Insulate all generators and heavy duty equipments or place them in enclosures to minimize high noise levels.

(viii) Reduction of risks of accidents and injuries to workers

- Ensure that the contractor adheres to the occupational health and safety rules and regulations.
- Provide workers with insurance cover for example workmen's compensation.
- First aid facilities should be availed at the site office. These include properly stocked first aid boxes and persons in charge of first aid box should be competent and licenced to handle first aid.
- Providing scaffolds for construction at high level
- Document and display on-site emergency procedures
- Use appropriate signage to direct and control flow of traffic
- A general accidents register should be kept on- site.
- Provide and enforce use of personal protective equipments - during construction all workers should wear protective clothing including overalls, helmets, safety boots and gloves among others where necessary.
- Create EHS awareness among the personnel prior to commencing work.
- Ensure proper storage of materials and equipments to avoid accidents occurring from falling - delivery and storage of material at appropriate locations.
- Provide temporally sanitary facilities during construction.
- Water surfaces before and during excavation and construction to reduce dust generation.
- Restrict un-necessary movement of public to the site in order to avoid accidents. All access to the hazardous areas should be secured with a fence and warning notices
- Development a clear site organization and working schedule
- Ensure portable fire extinguishers are provided and in working condition near probable ignition sources
- Adequate and clean water supply for drinking.
- Maintain environmental management records on site during and after construction period.

(ix) Reduction of energy consumption

- Staff should be sensitized to switch off equipments and lights when not being used
- Consider the possibility of using alternative sources of energy especially renewable ones such as solar
- Monitor energy use during the operation of the premise and set targets for efficient energy use
- Have proper planning of transportation of materials in order to save fossil fuels (diesel, petrol).

(x) Minimization of water use

- Any water leaks through damaged pipes should be fixed promptly.
- Sensitize the staff to use water efficiently/sparingly.
- Enhance rain water harvesting by use of tanks and other containers.
- Ensuring taps are not running when not in use
- Install automatic taps

(xi) Drainage of storm water

- Harvest rainwater as much as possible. This includes water from the roofs and impervious surfaces and storage for domestic and gardening purposes.

(xii) Minimizing traffic impacts

- Erect proper warning signs on both sides of the road to warn motorist of heavy vehicle turning.
- Ensure the trucks do not damage the road structures.
- Ensure use of only serviceable vehicles and equipments during transportation.
- Transportation of the materials and construction works should take the shortest period possible.
- Minimize damage to existing drainage system during transportation.
- Ensure minimal grease and oil leakage.

5.2 Mitigation of adverse impacts during operation

(i) Ensuring efficient solid waste management

- Proponent should provide waste handling facilities such as waste storage chamber/receptacles for temporarily holding solid waste generated at the premise.
- Ensure segregation of waste by separating hazardous waste from non-hazardous waste for appropriate disposal
- Contract a licensed waste firm for proper waste disposal.

(ii) Minimization of sewage release

- Connect the new development to Hospital waste water treatment plant
- Ensure proper maintenance of internal sewer network.
- Ensure that sewage pipes are not blocked or damaged since such vices can lead to release of the effluent, resulting in land and water contamination.

(iii) Ensure efficient energy consumption

- Install energy-efficient lighting systems within the premise.
- Sensitize residents on energy conservation through efficiency use of energy.

(iv) Ensure efficient water use

- Install water-conserving automatic taps.
- Fix promptly any water leaks, damaged pipes and faulty.
- Sensitize the residents to use water efficiently.

INITIAL ENVIRONMENTAL EXAMINATION (IEE) - USAID/ASHA GRANT ACTIVITIES

Overseas Institution (OSI):
Address: _____
Sponsoring U.S. Organization (USO):
Address: _____

USAID/ASHA Grant No. ____-___ Life of Grant: from __/__/____to __/__/____

ENVIRONMENTAL CONCERNS	EXISITING CONDITIONS (WITHOUT CONSTRUCTION or MAJOR RENOVARION)	POTENTIAL PROBLEMS (DUE TO CONSTRUCTION or MAJOR RENOVAION)	PROPOSED MITIGATION MEASURES
Noise Pollution	Noise levels are within recommended standards	Possibility of elevated noise levels main from construction machinery	▪ Minimize noise and vibration in the project site and surrounding areas through sensitization of drivers to switch off vehicle engines while offloading materials. ▪ Instruct the drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals. ▪ Ensure construction machineries are kept in good condition in order to reduce noise generation. ▪ Insulate all generators and heavy duty equipments or place them in enclosures to minimize high noise levels.
Waste generation	Normal waste quantities which are disposed through an incinerator	Possibility of increased construction waste and operational waste	→ Use durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. → Provide facilities for proper handling and storage of construction materials to reduce the

			amount of waste caused by damage or exposure to the elements of nature i.e. sunshine, rain etc → Containers or package for storing hazardous waste including used oil to be securely bunded and labelled as provided for by Waste Management Regulations, 2006 → Segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal → Contract a licensed waste firm to collect solid waste from the site for dumping at an approved site → Accumulate scrap metals in a scrapping yard and contract a scrap metal dealer with a valid license for appropriate disposal/recycling → Minimizing waste generated by adopting cleaner production methods such as conserving raw materials, enabling the recovery and re-use of the waste product where possible. → Use building materials that have minimal packaging to avoid the generation of excessive packaging waste → Use construction materials containing recycled content where possible and in accordance with accepted standards.
Air /Dust pollution	Normal Ambient air condition	Possibility of increased dust during construction mainly from excavation, material stock piles and transportation	• Ensure strict enforcement of on-site speed limit regulations • Avoid excavation works in extremely dry weather. • Sprinkle water on graded access routes each day to reduce dust generation by construction vehicles. • Provide screens made of iron sheets to reduce dust exposure.

			• Provide dust masks to workers in extreme dust producing operations. • Maximize the use of manual labour and hand tools. • Avoid spillage of loose soil to the road where it will be disturbed and blown by traffic.
Soil erosion	Minimal soil erosion	Possibility of soil erosion due to excavation works	▪ Site excavation works should be planned such that a section is completed and rehabilitated while another section begins. ▪ Apply soil erosion control measures ▪ Excavation material should be loaded into trucks and be transported to designated disposal sites. ▪ Reuse the topsoil in landscaping other places.
Use of heavy machinery	No Impacts	Hydraulic and motor oil and other chemical leaks from machines.	→ Take precautions and minimize potential spills and accidents. → Recycle motor oil and dispose other oils properly. → Adopt techniques to minimize noise.
Occupational health and safety	Low impacts	Possibility of occupational hazards and accidents	→ Ensure that the contractor adheres to the occupational health and safety rules and regulations. → Provide workers with insurance cover for example workmen's compensation. → First aid facilities should be availed at the site office. These include properly stocked first aid boxes and persons in charge of first aid box should be competent and licenced to handle first aid. → Providing scaffolds for construction at high level → Document and display on-site emergency procedures → Use appropriate signage to direct and control flow of traffic → A general accidents register should be kept on-

			site. → Provide and enforce use of personal protective equipments - during construction all workers should wear protective clothing including overalls, helmets, safety boots and gloves among others where necessary. → Create EHS awareness among the personnel prior to commencing work. → Ensure proper storage of materials and equipments to avoid accidents occurring from falling - delivery and storage of material at appropriate locations. → Provide temporally sanitary facilities during construction. → Water surfaces before and during excavation and construction to reduce dust generation. → Restrict un-necessary movement of public to the site in order to avoid accidents. All access to the hazardous areas should be secured with a fence and warning notices → Development a clear site organization and working schedule → Ensure portable fire extinguishers are provided and in working condition near probable ignition sources → Adequate and clean water supply for drinking. → Maintain environmental management records on site during and after construction period.
Effluent	No impacts	Increased wastewater during operation	→ Put in place measures for quick detection and maintenance of internal sewer pipes. → Connect the new development to Hospital waste water treatment plant

Energy	No Impact	Increased energy demand	▪ Install energy saving lighting system ▪ Switch off equipments and lights when not being used. ▪ Consider the possibility of using alternative sources of energy especially renewable ones such as solar
Water resources	No impact	Increased water demand	▪ Put in place measures for quick detection and repair of pipe and tank leaks ▪ Sensitize residents to use water more efficiently ▪ Ensure taps are not running when not in use
Fire hazards	No Impact	Possibility of fire hazards during both construction and operation phase	▪ Regular inspection and servicing of the extinguishers must be undertaken by a reputable service provider and records of such inspections maintained ▪ Signs such as "NO SMOKING" must be prominently displayed in the common area ▪ Residents should be sensitized on fire safety ▪ Circuits must not be overloaded ▪ Distribution board switches must be clearly marked to indicate respective circuits ▪ Avoid exposed live wires and loose connections ▪ Electrical fittings near all potential sources of ignition should be flame proof ▪ All electrical equipments must be earthed

NOTES:

a. An Engineer or an Environmental Specialist, experienced with projects of comparable size and complexity, shall do environmental examination of a construction/renovation activity under a USAID/ASHA grant. S(he) will be familiar with USAID and cooperating country environmental regulations.
b. The Engineer/Environmental Specialist shall recommend specific measures so that, when completed, the facility (or facilities) will not cause any unacceptable environmental impact.

6.0 MONITORING AND EVALUATION

In ensuring proper mitigation measures are instituted the proponent will need to ensure the following:

- He is involved in every stage of the project implementation and particularly on the management of the anticipated wastes and emissions into the environment as well as other concerns that may touch on the neighbouring residents,
- That the entire project implementation will not cause any unnecessary disruption to pubic utilities, storm water/surface runoff drainage systems, ecological systems and human settlement. Whenever any of these problems or any other impact highlighted in this report are anticipated, then the management should take appropriate mitigation actions.
- Take all necessary technological considerations that will prevent wastes/effluent and emissions into the receiving environment. In this regard, the management should be expected to constantly consult with an environmental expert.

Contractor should carryout self monitoring process for standards of construction activities with the involvement of the proponent. The proponent should also be directly responsible for the overall management and maintenance of the system.

The implementing partners will actively monitor and evaluate whether environmental consequences unforeseen under activities covered by this IEE rise during implementation, and modify or end activities as appropriate. If additional activities are added that are not described in this document, an amended environmental examination must be prepared. Implementing partners' annual reports and, as appropriate, progress reports shall contain a brief update on mitigation and monitoring measures being implemented, results of environmental monitoring, and any other major modifications/revisions in the development activities, and mitigation and monitoring procedures.

7.0 SUMMARY OF FINDINGS

Environmental determination and Recommendation

The study findings show that the negative environmental impacts are minimal both in magnitude and scope. Environmental issues such as solid waste disposal, wastewater treatment and sustained water and energy supply have been considered in this assessment. This calls for putting up mitigation measures to adequately address the risks and dangers that these impacts pose to the community and the environment. The proponent should therefore address these issues by making a commitment to monitor the environment to the satisfaction of NEMA. There are also inherent positive impacts in the project that include: improved academic development, source of employment to the locals, optimal land use, market for supply of building materials during construction and gains in the local and national economy

In summary, the potential negative impacts of the project are low and can be mitigated through the recommended mitigation measures; therefore they should not prevent the project from proceeding. Provided implementation is done with due attention to the mitigation and management measures outlined, the proposed project will have a positive impact on both the bio-physical and socio-economic environment of the project area and Kenya at large.

Potential issues (identified during this IEE) that need to be addressed along with potential mitigation measures that can be adopted has been presented in the report. However in compliance with local environmental requirements, the project requires an Environmental Impact Assessment (EIA) to identify and mitigate potential adverse impacts on the environment of the construction of the academic building. It is expected that an EIA process may bring out more issues and mitigation measures that have to be addressed.

REFERENCES

- Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. *Government printer, Nairobi*
- Kenya gazette supplement Acts *Building Code 2000 by government printer, Nairobi*
- Kenya gazette supplement Acts *Land Planning Act (Cap. 303) government printer, Nairobi*
- Kenya gazette supplement Acts *Local Authority Act (Cap. 265) government printer, Nairobi*
- Kenya gazette supplement Acts Penal Code Act (Cap.63) *government printer, Nairobi*
- Kenya gazette supplement Acts *Physical Planning Act, 1999 government printer, Nairobi*
- Kenya gazette supplement Acts *Public Health Act (Cap. 242) government printer, Nairobi*
- Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003. *Government printer,* Nairobi*.*

Annex 1: Supplemental IEE information requested by DCHA BEO:

RE: REVIEW COMMENTS FOR THE INITIAL ENVIRONMENTAL EXAMINATION REPORT - USAID/ASHA GRANTS FOR CONSTRUCTION OF A TWO STOREY ACADEMIC BLOCK AT PCEA TUMUTUMU HOSPITAL, KENYA

Please find the additional information as you email request: -

(i) Size of the new building in (m^2).

The new building will occupy an area of 810m^2 as per the architectural plans.

(ii) Number of occupants and what rough percentage are full or part-time tenure.

The project is expected to hold 500 students of which 40% will be full time and 60% part-time.

(iii) Water source and availability of water.

The main water sources for the hospital include surface water abstraction from Ragati River within Mt Kenya Forest and about 18km from the hospital. There is also an onsite borehole which was drilled in 2009 and acts as a back up during lower water pressure from the river. The hospital also harvests rain water which is store in water tanks. The water is expected to be used during construction and operation phases.

(iv) Medical waste management.

The hospital has several measures for ensuring efficient medical waste management. There are currently two methods of handling medical waste at the hospital. One method involves incineration of medical wastes using an incinerator and the other involves use of airtight **pit** for **placenta disposal.**

Highly infectious waste, such as cultures and stocks of infectious agents from laboratory work, are sterilized by wet thermal treatment (autoclaving) at the earliest stage possible. Sharps undergo incineration whenever possible, and are incinerated together with other infectious waste. After incineration or other disinfection, the residue is disposed into an ash pit.

Several other waste management measures have been discussed below:

(a) Waste minimization

Over several the hospital has been working on waste minimization. It is a proven cost-effective approach that has helps both the hospital and the environment. Combined with a comprehensive volume reduction effort, the hospital has significantly reduced its waste generation.

Significant reduction of the waste generated at the hospital has been encouraged by implementation of several policies and practices which include the following:

- Source reduction: measures such as purchasing restrictions to ensure selection of methods or supplies that are less wasteful or generate less hazardous waste.
- Recyclable products: use of materials that may be recycled, either on-site or off-site.
- Good management and control practices: apply particularly to the purchase and use of chemicals and pharmaceuticals.
- Waste segregation: careful segregation (separation) of waste into different categories helps to minimize the quantities of hazardous waste.
- Careful management of stores prevents accumulation of large quantities of outdated chemicals or pharmaceuticals and limit waste to the packaging (boxes, bottles, etc.) plus residues of the products remaining in the containers. These small amounts of chemical or pharmaceutical waste are disposed of easily and relatively cheaply, whereas disposing of larger amounts requires costly and specialized treatment, which underlines the importance of waste minimization.

- Waste minimization benefits the hospital since the costs for both the purchase of goods and for waste treatment and disposal are reduced and the liabilities associated with the disposal of hazardous waste is minimized.
- All hospital workers are trained in waste minimization and management of hazardous materials especially the medical/clinical departments which generate large quantities of medical waste.
- In an effort to encourage the suppliers of chemicals and pharmaceuticals to be more responsible partners in waste minimization programmes. The hospital only orders from suppliers who are compliance will environmental regulations and standards.
- Stock management of chemical and pharmaceutical products
    - → Frequent ordering of relatively small quantities rather than large amounts at one time (applicable in particular to unstable products).
    - → Use of the oldest batch of a product first.
    - → Use of all the contents of each container.
    - → Checking of the expiry date of all products at the time of delivery.

(b) Reuse and recycling

Medical and other equipments used in the hospital are highly not recommended for reuse even if they withstand the sterilization process due to high risk of infection. These items include certain sharps, such as scalpels and hypodermic needles, syringes, glass bottles and containers.

Materials which are reused include waste generated from maintenance works like waste timber and scrap metals.

(c) Waste segregation and collection

The key to minimization and effective management of waste at the hospital has been segregation (separation) and identification of wastes. Appropriate handling, treatment, and disposal of waste by type reduce costs and do much to protect public health. In order to ease this activity at the hospital, segregation mostly takes place as close as possible to where the waste is generated by sorting the waste into colour-coded plastic bags or containers. In addition to the colour coding of waste containers, the following practices are practiced at the hospital:

- General medical waste always joins the stream of domestic refuse for disposal.
- All sharps are collected together, regardless of whether or not they are contaminated.
- Collection containers are normally puncture-proof (usually made of metal or high-density plastic) and fitted with covers so that they safely retain not only the sharps but also any residual liquids from syringes.
- Bags and containers for infectious waste are marked with the international infectious substance symbol
- Highly infectious waste are always whenever possible, sterilized immediately by autoclaving and placed in red bags
- Small amounts of chemical or pharmaceutical waste are collected together with infectious waste.
- Large quantities of obsolete or expired pharmaceuticals are returned to the pharmacy for disposal.
- Large quantities of chemical waste are packed in chemical-resistant containers and sent to specialized treatment facilities.
- Waste with a high content of heavy metals (e.g. cadmium or mercury) are collected separately and sent to licensed hazardous industrial waste disposal companies.
- Instructions on waste separation and identification are posted at each waste collection point to remind staff of the procedures. Containers are removed when they are three-quarters full. Staff have been sensitized never to attempt to correct errors of segregation by removing items from a bag or container after disposal or by placing one bag inside another bag of a different color. If general and hazardous wastes are accidentally mixed, the mixture is treated as hazardous healthcare waste.
- There is a routine programme for waste collection as part of the medical waste management plan.
- As disposal rule storage times for medical waste (i.e. the delay between production and treatment) does not exceed 48 hours during the cool season, 24 hours during the hot season.
- Medical waste is transported within the hospital by means of wheeled trolleys, or containers that are not used for any other purpose and with specifications such as: Easy to load and unload; No sharp edges that can damage waste bags or containers during loading and unloading; Easy to clean. The trolley are cleaned and disinfected daily with an appropriate disinfectant.
- All waste bags or containers are labelled with basic information on their content and on the waste producer. This information are normally written directly on the bag or container or on preprinted labels, securely attached. For medical waste, the following additional information is normally marked on the label: Waste

category, Date of collection, Place in hospital where produced (e.g. ward) waste destination, In case of problems involving questions of liability, full and correct labelling allows the origin of the waste to be traced. Labelling also warns operative staff and the general public of the hazardous nature of the waste. The hazards posed by container contents can be quickly identified in case of accident, enabling emergency services to take appropriate action.

- Medical waste is transported by the quickest possible route, which is normally planned before the journey begins. After departure from the waste production point, every effort is made to avoid further handling
- Small quantities of pharmaceutical waste may be incinerated together with infectious or general waste, provided that they do not form more than 1% of the total waste (in order to limit potentially toxic emissions to the air).
- Large quantities of pharmaceutical wastes are returned to supplies though there are very few cases.
- Small quantities of hazardous chemical waste, e.g. residues of chemicals inside their packaging, may be dealt with by incineration.

NOTE: The hospital ensures that staff members have thorough training on how to handle equipments, instruments and infectious materials. In addition, personal protective equipments such as hand gloves and nose masks are provided to reduce chances of occurrence of such impacts.

(d) Hospital financial and technical capacity on medical waste management.

Technical competence of the operator

The incineration facility is operated by properly qualified personnel with training in the operating practices and procedures which will include the following:

- The characteristics of hazardous waste and the procedures for its handling;
- The basic principles of waste incineration and emission of contaminants there from;
- Knowledge of the waste management license requirements;
- Basic features of the incinerator, emission control system, and other equipments at the facility;
- Proper operation, functioning and maintenance of all mechanical, emission control and monitoring equipments;
- Detection of excessive emissions and procedures to be followed during such occasions; and
- Response procedures and measures to be taken during emergency situations.
- Occupational, health and safety procedures and safety equipments

Financial provision

The hospital continuously allocates financial resources for the incinerator maintenance, PPEs, personnel training, annual environmental audit among others. Currently the hospital is in the process of up grading the incinerator.

We belief we have satisfactorily addressed issue raised by DCHA/USAID Bureau Environmental Officer.

Yours truly
WILLIAM KAGIA GATHUA

B.Sc. (Eng.) (Hons), Lead Expert (NEMA)